SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Modular face brick.
2. Standard load-bearing concrete masonry units
3. Reinforcement, anchorage, and accessories.
4. Mortar for masonry.
5. Grout for masonry.
6. Embedded flashings.
7. Cavity drainage system.
8. Miscellaneous masonry accessories

B. Products Installed But Not Supplied Under This Section:

1. Section 05500 - Metal Fabrications: Loose steel lintels.
2. Section 06100 - Rough Carpentry: Treated wood nailers and blocking built into masonry.

C. Related Sections:

1. Section 01450 – Testing Laboratory Services: Testing agency qualifications for grout and other masonry materials.
2. Section 03300 - Cast-In-Place Concrete: Reinforcing bars.
3. Section 05120 - Structural Steel: Steel shelf angles.
4. Section 05400 - Cold-Formed Metal Framing: Metal stud back-up for brick veneer.
5. Section 07272 - Vapor Permeable, Fluid-Applied Membrane Air Barriers: Weather-resistant barrier installed over sheathing.
6. Section 07210 - Building Insulation: Batt insulation at stud walls.
7. Section 07620 - Sheet Metal Flashing and Trim: Reglets in masonry joints for metal flashings.
8. Section 07840 – Firestopping: Materials and assemblies required to maintain specified fire-ratings.
9. Section 07920 - Joint Sealants: Backer rod and sealant at control joints.
10. Section 08110 - Steel Door and Frames: Doors and frames set into masonry walls.
11. Section 09255 - Exterior Sheathing: Sheathing at brick veneer.
12. Section 09310 – Ceramic Tile.

1.2 REFERENCES

A. Industry Standards: The Industry Standards listed below refer to the latest date of issue or edition, unless otherwise indicated.

1. ACI 530.1/ASCE 6: Specifications for Masonry Structures.
2. ASTM A82: Cold-Drawn Steel Wire for Concrete Reinforcement.
3. ASTM A153: Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A525: Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.

5. ASTM A615: Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
6. ASTM C90: Hollow Load Bearing Concrete Masonry Units.
7. ASTM C91: Masonry Cement.
8. ASTM C144: Aggregate for Masonry Mortar.
9. ASTM C150: Portland Cement.
10. ASTM C207: Hydrated Lime for Masonry Purposes.
11. ASTM C216: Facing Brick (Solid Masonry Units Made From Clay or Shale).
12. ASTM C270: Mortar for Unit Masonry.
13. ASTM C404: Aggregates for Masonry Grout.
14. ASTM C476: Grout for Masonry.
15. ASTM C780: Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
16. ASTM C979: Pigments for Integrally Colored Concrete.
17. ASTM C1019: Method of Sampling and Testing Grout.
18. ASTM C1142: Ready-Mixed Mortar for Unit Masonry.

1.3 SUBMITTALS

A. Product Data: Submit product data for all masonry units, mortar, grout and fabricated wire reinforcements and accessories.

B. Samples for Verification: Submit the following for verification:

1. Full-size units for each different exposed masonry unit required showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
2. Colored-masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used in the Project. Label samples to indicate type and amount of colorant used.
3. Cavity drainage/weep hole materials.
4. Accessories embedded in the masonry.

C. Mortar/Grout Design Mix: Submit design mix, indicating Proportion or Property method used, required environmental conditions, and admixture limitations.

D. Material Certificates: Submit manufacturer's certificates for the following, signed by manufacturer and Contractor, certifying that each material complies with specified requirements:

1. Each different cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
2. Each type and size of joint reinforcement.
3. Each type and size of anchors, ties, and metal accessories.
4. Each type and size of fire rated units.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Each type of unit masonry shall be obtained from one manufacturer.

B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per

ASTM E 119 by a testing and inspecting agency, by equivalent masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

C. **Single-Source Responsibility for Masonry Units:** Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.

D. **Single-Source Responsibility for Mortar Materials:** Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

E. **Qualifications of Workmen:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

F. **Supervision:** At least one skilled journeyman mason shall be present at all times during masonry work to personally supervise all work of this Section.

G. **Pre-installation Conference:** Conduct conference at Project site to comply with requirements of "Section 01314 - Project Meetings."

1.5 MOCK-UP

A. **Mock-Up:** Provide a 4' x 6' Mock-Up of a typical masonry veneer wall system.
   1. Mock-up shall illustrate veneer wall system showing typical control joints, insulation, dampproofing, masonry ties, column ties, shelf-angles, thru-wall flashings, sealants, weep holes and accessories.
   2. Verify actual configuration and components with Architect prior to construction of mock-up.

B. **Acceptance:** When accepted, mock-up will demonstrate minimum standard for the Work. Mock-up may NOT remain as part of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. **Store masonry units** on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.

B. **Store cementitious materials** on elevated platforms, under cover, and in a dry location.

C. **Store aggregates** where grading and other required characteristics can be maintained and contamination avoided.

D. **Store masonry accessories,** including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

A. **Protection of Masonry:** During construction, all masonry walls (including tops of walls, projections, and sills) shall be kept dry by covering with a strong, waterproof membrane at the end of each workday or shutdown period. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Loading: Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Construction: Do not perform masonry work when air temperature is 40 deg F (4 deg C) or lower.

1. Do not lay masonry units that are wet or frozen.
2. Remove masonry damaged by freezing conditions.
3. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot Weather Construction: When air temperature exceeds 100 deg. F (or 90 deg. F with wind over 8 mph), do not spread mortar more than 4 feet ahead of masonry, and set units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
   a. All requests for substitutions must be submitted prior to bid.

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 FACE BRICK UNITS

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: :

1. Manufacturer:
   a. Acme Brick Company
   b. Blend 167
2. Size: Standard modular, 2-1/4" x 3-5/8" x 7 5/8" inches.
3. Type: wire cut, meeting requirements of ASTM C216; grade SW, Type FBS.
4. Finish: Velour, wire cut.
5. Color Range:
   a. Acme: PEP Blend 167, Slate Gray, Type C, modular velour, as manufactured by Acme Brick (Perla Plant).

2.4 CONCRETE MASONRY UNITS

A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide lightweight classification units (80 pcf).
2. Size: Provide concrete masonry units that are manufactured to indicated dimensions within tolerances specified in the applicable referenced ASTM specification.
   a. Standard Concrete Masonry Units: Manufactured to dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
   b. Concrete Building Brick: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
   c. Integrally Colored Concrete Masonry Units: 1/4 inch less than nominal widths and 3/8 inch less than nominal heights by nominal lengths indicated on drawings.
3. Provide Type I, moisture-controlled units.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
5. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N.
6. Solid Load-Bearing Concrete Masonry Units: ASTM C 145, Grade N.
7. Concrete Building Brick: ASTM C 55.

B. Shapes: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished CMU surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
3. Provide square-edged units for outside corners, unless otherwise indicated.

4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
2. Products:
   a. Addiment Incorporated; Block Plus W-10.
   b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
   c. Master Builders, Inc.; Rheopel.
   d. ACM Chemistries Inc., “RainBlock”

D. Concrete Masonry Units: ASTM C 90

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa)
2. U.L.Fire- Rated CMU: Rating as required, see Drawings for locations
3. Weight Classification: Lightweight
4. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions

2.5 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Colored Masonry Cement Mix (to be used only at interior exposure): Provide premixed, colored masonry cements of formulation required to produce color as selected by Architect from manufacturer's standard and custom formulations. Each bag of mix shall comply with performance and proportion specifications of ASTM C91.

1. Approved Products/Manufacturers:
   a. "Holcim Rainbow Mortamix Custom Color Masonry Cement"; HOLCIM, INC.
   b. "Custom Color Mortar"; UNITED STATES CEMENT CO.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.

1. White-Mortar Aggregates: Natural white sand or ground white stone.
2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match Architect's sample.

E. Aggregate for Grout: ASTM C 404.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

   a. Addiment Incorporated; Mortar Tite.

b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
c. Master Builders, Inc.; Color Cure Mortar Admix or Rheomix Rheopel.
d. ACM Chemistries Inc., "RainBlock"

G. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

H. Ready-Mixed Mortar (Subject to approval by Architect): Cementitious materials, water, and aggregate complying with requirements specified in this Article; combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C 1142.

I. Water: Potable.

2.6 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.
3. Interior and exterior unit masonry shall have water-repellent admixture.

B. Mortar Type for Unit Masonry:
1. For Interior work: "Type N" mortar; comply with ASTM C 270.
2. For Exterior work: "Type N" Portland cement - hydrated lime formulated mortar complying with ASTM C 270 for exterior exposure. No masonry cement allowed for exterior exposure.
3. Retempering: If water is lost by evaporation, retemper only within two hours of mixing.

C. Grout for Unit Masonry: 4000psi strength at 28 days; ⅞ inches slump; premixed type in accordance with ASTM C 94; mixed in accordance with ASTM C476 Fine and Course grout.
1. Fine Grout: Use in grout spaces less than 2 inches (50 mm) in horizontal dimension, unless otherwise indicated.
2. Coarse grout: Use in grout spaces 2 inches (50 mm) or more in least horizontal dimension, unless otherwise indicated.

2.7 REINFORCING STEEL

A. Steel Reinforcing Bars: Billet steel complying with ASTM A 615 (ASTM A 615M), Grade 60 (Grade 400).

2.8 HORIZONTAL JOINT REINFORCEMENT

A. General: Horizontal joint reinforcement shall be prefabricated for embedment in horizontal mortar joints of masonry, manufactured and welded in 10 foot lengths from cold-drawn steel wire conforming with ASTM A82 requirements.
1. Prefabricated Corners and Tees: Required for each type of wall reinforcing.

2.9 ADJUSTABLE VENEER ANCHORS FOR METAL STUDS

A. **Adjustable Veneer Anchors:** Use adjustable, hot-dip galvanized anchors to attach face brick veneer to metal stud backup.
   1. Approved Products/Manufacturers:
      a. "D/A 213"; DUR-O-WAL.
      b. "RJ-711"; MASONRY REINFORCING CORPORATION OF AMERICA.
   2. Screws: Two stainless steel self-tapping screws per anchor; #12 x length required to penetrate steel stud flange by not less than 3 exposed threads.

2.10 TIES AND ANCHORS

A. **Column Ties and Anchors:** 3/16" diameter, hot-dipped galvanized triangular ties with 5/16" x 5" long hot-dipped galvanized column anchors welded to steel columns for anchorage of C.M.U. walls. Provide sizes to fit field conditions. Refer to Drawings.
   1. Approved Products/Manufacturers:
      a. "D/A 701"; DUR-O-WAL.
      b. "#VWT"; HOHMANN & BARNARD, INC.
      c. "#316"; HECKMAN, INC.

2.11 COLUMN ANCHORS

A. **Column Anchors:** 1 1/4" wide x 12 gauge thick, hot-dipped galvanized column anchors for anchoring masonry to structural column when masonry is perpendicular to column flange. Provide flange widths and lengths to fit field conditions. Refer to Drawings.
   1. Approved Products/Manufacturers:
      a. "D/A 606"; DUR-O-WAL.
      b. "#353"; HOHMANN & BARNARD, INC.
      c. "#197"; HECKMAN, INC.

2.12 JOINT STABILIZATION ANCHORS

A. **Joint Stabilization Anchors:** Use for bridging vertical control joints; Dur-O-Wal - #D/A 2200 or approved equal. Space at 16" o. c. maximum.

2.13 RIGID ANCHORS (As Required)

A. **Fabricate from steel bars as follows:** 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by length required with ends turned up 2 inches (50 mm) or with cross pins. Refer to drawings for locations and sizes.

2.14 MISCELLANEOUS ANCHORS

A. **Anchor Bolts:** Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
   1. Headed bolts.
   2. Non-headed bolts, straight.
   3. Non-headed bolts, bent in manner indicated.

B. Post-installed Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Expansion anchors.
2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 167 or ASTM A 276, Type 304 or 316, for anchors.
3. For Post-installed Anchors in Concrete: Capability to sustain, without failure, a load equal to 4 times the loads imposed by masonry.
4. For Post-installed Anchors in Grouted Concrete Masonry Units: Capability to sustain, without failure, a load equal to 6 times the loads imposed by masonry.

2.15 EMBEDDED FLASHING MATERIALS

A. Copper-Fabric Laminate Flashing: 5 ounce copper sheet bonded with asphalt between two layers of glass-fiber cloth.

1. Approved Products/Manufacturers:
   a. "Copper Fabric"; AFCO Products, Inc.
   b. "Type FCC-Fabric Covered Copper"; Phoenix Building Products.
   c. "Copper Fabric Flashing"; Sandell Manufacturing Co., Inc.
   d. "York Copper Fabric Flashing";York Manufacturing, Inc.
2. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

2.16 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control Joints (where applicable): Extruded rubber conforming to ASTM D-2000 2AA-805 with 80 durometer hardness conforming to ASTM D2240, designed for use in control joints in solid or cavity wall construction to provide resilient resistance to cracking under stress of expansion and contraction. Fire-rated materials required to maintain fire-rated assemblies as indicated on drawings.

1. Size and Configuration: As required for compliance with drawings.

B. Horizontal (Soft Joint) Expansion Joint: 1/4" x 2 3/4" adhesive on one side with compression up to 35%, closed cell neoprene per ASTM D-1056, Class RE41. Fire-rated materials required to maintain fire-rated assemblies as indicated on drawings.

C. Vertical Expansion Joint: 3/8" x 3", no adhesive with compression up to 35%, closed cell neoprene conforming to ASTM D-1056, Class RE41. Fire-rated materials required to maintain fire-rated assemblies as indicated on drawings.

D. Mortar/Grout Screen: 1/4 square monofilament screen fabricated from high-strength, non-corrosive polypropylene polymers; 4", 6", or 10 widths, as required.

E. Sealant and Backer Rods: Exterior quality in accordance with "Section 07920 - Joint Sealants". Fire-rated materials required to maintain fire-rated assemblies as indicated on drawings.

1. Color: To be selected by Architect.

F. Moisture Barrier: See Section 07272 - Vapor Permeable, Fluid-Applied Membrane Air Barriers.

G. Cleaning Solutions: As recommended by manufacturer of masonry units.

2.17 CAVITY WALL DRAINAGE SYSTEM

A. Cavity Drainage Mesh Material: Free-draining mesh made from polyethylene strands of manufacturer's standard. Material thickness shall be equal to brick cavity dimension

1. Approved Products/Manufacturers:
   a. "Mortar Net"; MORTAR NET USA, INC.
   b. "Mortar Maze"; ADVANCED BUILDING PRODUCTS, INC.

B. Cell Vent Weep (Dur-O-Wal: D/A-1006): UV resistant polypropylene co-polymer weep of size and shape to fit vertical mortar joint of veneer.

1. Color : As selected by Architect from manufacturer's full range of colors.

2.18 LINTELS

A. Steel Lintels: Hot-dip galvanized, loose type steel angles as specified in "Section 05500 - Miscellaneous Metal Fabrications".

1. Size: As indicated on Drawings or in Specifications.

2.19 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.

1. For masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents.
2. For dark-colored masonry not subject to metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors.
3. For masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors.
4. Approved Products/Manufacturers for brick walls
   a. "Sure Klean Vana Trol"; PROSOCO, INC.
   b. "202V Vana-Stop"; DIEDRICH TECHNOLOGIES, INC.
5. Approved Products/Manufacturers for Ground Face Block walls:
   a. "Sure Klean "Burnished Custom Masonry Cleaner"; PROSOCO, INC.
6. Approved Products/Manufacturers for all other CMU walls:
   a. "202 New Masonry Detergent"; DIEDRICH TECHNOLOGIES, INC.
   b. "200 Lime Solv"; DIEDRICH TECHNOLOGIES, INC.
   c. "202V Vana-Stop"; DIEDRICH TECHNOLOGIES, INC.
   d. "Sure Klean No. 600 Detergent"; PROSOCO, INC.
   e. "Sure Klean No. 101 Lime Solvent"; PROSOCO., INC.
   f. "Sure Klean Vana Trol"; PROSOCO, INC.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Examine conditions,** with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. **Examine rough-in** and built-in construction to verify actual locations of piping connections prior to installation.

3.2 FIELD MORTAR MIXING

A. **All cementitious materials** and aggregate shall be mixed between 3 and 5 minutes in a mechanical batch mixer with the maximum amount of water to produce a workable consistency.

B. **Control batching** procedure to ensure proper proportions by measuring materials by volume. Sand measurement by shovel count shall not be permitted.

C. **If water is lost** by evaporation within 2 ½ hours after initial mixing, retemper with water.

D. **Discard all mortar,** which is more than 2 ½ hours old.

3.3 FIELD GROUT MIXING

A. **Control batching** procedure to ensure proper proportions by measuring materials by volume. Sand measurement by shovel count shall not be permitted.

3.4 INSTALLATION, GENERAL

A. **Install mortar and grout** in accordance with ACI 530/ASCE 6

B. **Wall Thickness:** Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.

C. **Build chases and recesses** to accommodate items specified in this and other Sections of the Specifications.

D. **Leave openings** for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.

E. **Cut masonry units** with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. **Mix units** for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

G. **Wetting of Brick:** Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

3.5 CONSTRUCTION TOLERANCES

A. **Variation from Plumb:** For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

1. All wall surfaces, where receiving operable panel partitions, shall be plumb to 1/8-inch per 10 feet of height, according to ASTM E 557

B. **Variation from Level:** For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. **Variation of Linear Building Line:** For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m), nor 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. **Variation in Cross-Sectional Dimensions:** For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch (6 mm) nor plus 1/2 inch (12 mm).

E. **Variation in Mortar-Joint Thickness:** Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.6 LAYING MASONRY WALLS

A. **Lay out walls in advance** for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

B. **Lay walls** to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. **Bond Pattern for Exposed Masonry:** Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below, or as otherwise indicated on Drawings.

D. **Lay concealed masonry** with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. **Stopping and Resuming Work:** In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean

exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

I. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:

1. Install compressible filler in joint between top of partition and underside of structure above. . Fire-rated materials required to maintain fire-rated assemblies as indicated on drawings

3.7 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells.

1. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
2. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 3/8-inch (10-mm) joints.

B. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.

1. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

C. Lay hollow brick as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit in place and one side of unit to be placed.
3. Maintain joint widths indicated, except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch (6- to 10-mm) joints.
4. At cavity walls, slope beds toward cavity to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against cavity face of brick.

D. **Tool exposed joints** slightly concave or V-groove when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
   1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.

E. **Cut joints flush** for masonry walls that are to receive plaster or other direct applied finishes (other than paint), unless otherwise indicated.

3.8 STRUCTURAL BONDING OF MULTIWYTHE MASONRY

A. **Use individual metal ties** installed in horizontal joints to bond wythes together, unless otherwise indicated on Drawings. Provide ties as shown, but not less than 1 metal tie for 4 sq. ft. (0.37 sq. m) of wall area spaced not to exceed 24 inches (610 mm) o. c. horizontally and vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o. c. vertically.

B. **Corners:** Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
   1. Provide continuity with horizontal-joint reinforcement at corners by using prefabricated "L" units in addition to masonry bonding.

C. **Intersecting and Abutting Walls:** Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
   1. Provide individual metal ties not more than 16 inches (406 mm) o. c.
   2. Provide continuity with horizontal-joint reinforcement by using prefabricated "T" units.
   3. Provide rigid metal anchors not more than 24 inches (610 mm) o. c. If used with hollow masonry units, embed ends in mortar-filled cores.

3.9 CAVITIES

A. **Keep cavities clean** of mortar droppings and other materials during construction. Strike joints facing cavities flush.

B. **Tie exterior wythe** to back-up with individual metal ties. Stagger alternate courses.

3.10 HORIZONTAL-JOINT REINFORCEMENT

A. **General:** Provide continuous horizontal-joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcing a minimum of 6-inches (150 mm).
   1. Space reinforcement not more than 16 inches (406 mm) o. c.
   2. Space reinforcement not more than 8 inches (203 mm) o. c. in foundation walls and parapet walls.
   3. Provide reinforcement in mortar joint 1 block course above and below wall openings and extending 12 inches (305 mm) beyond opening.

B. **Cut or interrupt joint reinforcement** at control and expansion joints, unless otherwise indicated.

C. **Provide continuity** at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.11 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. **Anchor masonry to structural members** where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
   2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches (610 mm) o. c. vertically and 36 inches (915 mm) o. c. horizontally.

3.12 ANCHORING MASONRY VENEERS

A. **Anchor masonry veneers** to metal studs with masonry-veneer anchors to comply with the following requirements:
   1. Fasten each anchor section through sheathing to metal studs with metal fasteners of type indicated.

3.13 CONTROL AND EXPANSION JOINTS

A. **General:** Install control and expansion joints in unit masonry where indicated. Build-in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
   1. Control joints shall be spaced at 30’-0” O.C. minimum. Architect shall approve locations of control joints.

B. **Control Joints in Concrete Masonry:** Install preformed control-joint gaskets designed to fit standard sash block.

C. **Control Joints In Brick:** Build-in horizontal pressure-relieving joints where indicated; construct joints by inserting a compressible filler of width required for installing sealant and backer rod specified in “Section 07920 - Joint Sealants".
   1. Locate horizontal pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

D. **Building Expansion Joints:** Form expansion joints as detailed on Drawings.

3.14 LINTELS

A. **General:** Provide lintels where shown and wherever openings of more than 12 inches (305 mm brick size units and 24 inches (610 mm) for block size units are shown without structural steel lintels. Install loose steel lintels for openings in brick masonry.
   1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout. Cure pre-cast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

B. Concrete Masonry Unit Lintels: Provide specially formed U-block units with reinforcement bars placed as indicated and filled with coarse grout, as follows:

U-Block Size	Max. Clear Span/Required Reinforcing						
	3'-4"	**4'-8"**	**5'-4"**	**6'-0"**	**6'-8"**	**7'-4"**	**8'-0"**
6"T, 8"H	1-#3	1-#4	2-#4	2-#5			
6"T, 16"H				1-#4	1-#4	1-#4	1-#4
8"T, 8"H	1-#3	2-#3	2-#4	2-#4	2-#5	2-#6	
8"T, 16"H						2-#5	2-#5

C. Loose Steel Lintels: Provide galvanized lintels for exterior exposed masonry; provide shop-primed lintels at interior masonry. Provide lintel sizes as follows, for each masonry wythe (long leg vertical):

Max. Span	**3'**	**4'**	**5'**	**6'**	**7'**
Lintel Size	3 x 3½ x ¼	3½ x 3½ x ¼	3½ x 4 x ¼	3½ x 5 x 5/16	3½ x 6 x 3/8
Max. Allow.Load	180 lbs.	320 lbs.	500 lbs.	720 lbs.	980 lbs.

D. Bearing: Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.15 FLASHING, CAVITY DRAINAGE AND WEEP VENTS

A. General: Install embedded flashing, cavity drainage material, and weep vents in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with mortar.

C. Flashing Installation: Cut off flashing flush with face of wall after wall construction is completed.

1. Composite Masonry Walls: At composite masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches (100 mm), and through the inner wythe to within ½ inch (13 mm) of the interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches (50 mm), unless otherwise indicated.
2. Masonry Veneer Walls: Extend flashing from exterior face of veneer, through the veneer, behind sheathing at least 8 inches (200 mm)above finished floor elevation, and behind air-infiltration barrier/building paper.
3. Lintels and Shelf Angles: Seal flashing to horizontal leg of lintels and shelf angles, and up at least 8”. Extend flashing a minimum of 4 inches (100 mm) into masonry at each end. At heads and sills, extend flashing 4 inches (100 mm) at ends and turn up not less than 2 inches (50 mm) to form a pan.
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.

5. Extend sheet-metal flashing ½ inch (13 mm) beyond face of masonry at exterior and turn down to form a drip.

D. Cell Vent: Place Cell Vent weeps on top of flashing in the vertical (head) joint of veneer and 1/8" back from face of veneer. Place at 16" o.c. horizontally the length of wall wherever flashing is located.

E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

F. Moisture Barrier Installation:

1. Install moisture barrier over exterior sheathing in accordance with manufacturer's written instructions.
2. Seal all joints and penetrations with manufacturer's recommended tapes and fasteners.

3.16 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

B. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Do not exceed the following pour heights for fine grout:
   a. For minimum widths of grout spaces of 3/4 inch (19 mm) or for minimum grout space of hollow unit cells of 1-1/2 by 2 inches (38 by 51 mm), pour height of 12 inches (305 mm).
   b. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2 by 3 inches (51 by 76 mm), pour height of 60 inches (1524 mm).
   c. For minimum widths of grout spaces of 2-1/2 inches (63 mm) or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches (63 by 76 mm), pour height of 12 feet (3.6 m).
   d. For minimum widths of grout spaces of 3 inches (76 mm) or for minimum grout space of hollow unit cells of 3 by 3 inches (76 by 76 mm), pour height of 24 feet (7.3 m).
2. Do not exceed the following pour heights for coarse grout:
   a. For minimum widths of grout spaces of 1-1/2 inches (38 mm) or for minimum grout space of hollow unit cells of 1-1/2 by 3 inches (38 by 76 mm), pour height of 12 inches (305 mm).
   b. For minimum widths of grout spaces of 2 inches (51 mm) or for minimum grout space of hollow unit cells of 2-1/2 by 3 inches (63 by 76 mm), pour height of 60 inches (1524 mm).

c. For minimum widths of grout spaces of 2-1/2 inches (63 mm) or for minimum grout space of hollow unit cells of 3 by 3 inches (76 by 76 mm), pour height of 12 feet (3.6 m).

d. For minimum widths of grout spaces of 3 inches (76 mm) or for minimum grout space of hollow unit cells of 3 by 4 inches (76 by 101 mm), pour height of 24 feet (7.3 m).

3. Provide cleanout holes at least 3 inches (76 mm) in least dimension for grout pours over 60 inches (1524 mm) in height.

a. Provide cleanout holes at each vertical reinforcing bar.

b. At solid grouted masonry, provide cleanout holes at not more than 32 inches (813 mm) o. c.

3.17 FIELD QUALITY CONTROL

A. **The Owner will employ** and pay a qualified independent testing agency to perform the following testing for field quality control. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense. Refer to "Section 01450 - Testing Laboratory Services".

B. **Testing Frequency:** Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.

C. **Grout Testing:** Grout will be sampled and tested for compressive strength per ASTM C 1019.

D. **Evaluation of Quality-Control Tests:** In the absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality-control tests comply with minimum requirements indicated.

3.18 REPAIRING, POINTING, AND CLEANING

A. **Remove and replace masonry units** that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. **Pointing:** During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.

C. **In-Progress Cleaning:** Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.

D. **Final Cleaning:** After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Face Brick: Clean face brick by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised, using one of the following masonry cleaners:
   a. Job-mixed detergent solution.
   b. Proprietary acidic cleaner, applied in compliance with directions of acidic cleaner manufacturer.

E. Protection: Provide final protection and maintain conditions that ensure unit masonry is without damage and deterioration at time of Substantial Completion.

3.19 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess masonry waste and legally dispose of off Owner's property.

3.20 PROTECTION OF FINISHED WORK

A. Protection: Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

END OF SECTION